REMARKS

The non-final Office Action of April 9, 2007 has been carefully reviewed and these remarks are responsive thereto. Claim 2 has been canceled and incorporated, in slightly amended form, into independent claim 1. Claims 1, 6-7, 12, 15-16, 19, and 20 have been amended. New claims 21-37 have been added. Upon entry of this amendment, claims 1 and 3-37 are pending.

Rejections Under 35 U.S.C. § 103

Applicant appreciates the examiner's careful and detailed analysis of the prior art. Nevertheless, in view of the amendments and arguments presented herein, reconsideration of the rejections is respectfully requested.

Claims 1, 5, 12, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Du et al ("Enhancing Accuracy of Probe Packet-Based Congestion Detection in High Speed Networks") in view of Vukovic et al. (U.S. Pub. No. 2004/0160916). According to the office action, Du teaches transmitting test packets over a network and evaluating which time slots correspond to favorable network traffic conditions, but does not teach transmitting data packets over the network using one or more favorable time slots. According to the office action, Vukovic teaches determining an optimal time slot to transmit data packets based on network conditions.

As amended, independent claim 1 recites transmitting test packets "wherein each test packet has a priority level that is lower than a priority level assigned to data packets that are to be transmitted between endpoints on the network, and wherein the test packets are transmitted so as to emulate data packets that are to be transmitted between the endpoints on the network." Support for this amended limitation can be found, for example, in paragraphs 13; 21; 27; 28; and FIG. 3 (priority levels); and FIG. 5. Because the test packets are transmitted at a lower priority level than data packets, they do not interfere with the existing network utilization – in other words, if there is contention in packet switches connecting the two endpoints, the lower-priority test packets will be discarded or delayed without affecting higher-priority data packets. See the present specification at paragraph 39 and FIG. 7. The test packets also emulate data packets that are to be transmitted between the endpoints on the network, thus providing a realistic gauge of future performance.[1]

1 (Note that the use of the word "highest" refers not to the numerical designator associated with the level but the precedence of the level, such that a "higher" priority packet is handled before a "lower" priority packet).

Also as amended, independent claim 1 specifically recites that the network is an Internet Protocol (IP) or Ethernet packet-switched network (specification paragraph 24). By empirically determining a desirable schedule for transmission of data packets, the delivery scheme can be implemented without specialized network hardware (specification paragraph 13). These features are not disclosed or suggested by either Du or Vukovic.

First of all, Du relates to ATM networks, not IP or Ethernet packet-switched networks, which exhibit different behaviors (note paragraphs 10-12 of the present specification). See also office action at page 13 (acknowledging that Du does not disclose using test packets over an IP network). Similarly, Vukovic discloses a radio transmission system, not an IP or Ethernet packet-switched network over which data packets are transmitted as claimed. Vukovic, in particular, is not in the same field of packet-switched networks.

Second, Vukovic actually teaches away from the combination of Du and Vukovic, and cannot properly be combined with Du. Vukovic discloses a radio transmission system wherein multiple radio transmitters may cause interference with each other. In Vukovic, the test packets are sent at the same priority level as the other packets, thus leading to network degradation when test packets are sent when contention is present in the system. In other words, in Vukovic, the test packets themselves can disturb previously-established flows on the network. See Vukovic at paragraph 6 ("These multiple probes contribute to system interference. Therefore, a need exists for a method and apparatus for transmitting information within a communication system that improves upon the LBT etiquette, yet does not generate the interference caused by the existing SANMA etiquette.") Vukovic then teaches the use of specialized hardware and administrative overhead to solve this problem, instead of the claimed feature of using a lower priority level for the test packets to avoid contention on the network. As explained in paragraph 13 of the present specification, the claimed scheme permits endpoints to schedule packets across a network without specialized network hardware.

The office action admits that neither Du nor Vukovic discloses this priority-based test packet feature, but in rejecting dependent claim 2, which recited a similar feature, the office action suggested that Tezuka et al. (U.S. Pub. No. 2003/0107991) could be combined with Du and Vukovic, and that Tezuka discloses such a feature. Applicant respectfully disagrees. The office action points to paragraph 19 of Tezuka as showing this feature. In fact, Tezuka shows exactly the opposite of the claimed priority level requirement. In Tezuka, audio flows are

already present on the network. At some point, with the addition of more same-priority audio traffic, congestion occurs. When this occurs, the last flow that was added – i.e., the flow that triggered the congestion – is either reduced in priority level or discarded. As explained in paragraph 19 of Tezuka, the priority of the test packets is initially set at a "predetermined priority" level to test flows in the first and second directions. When congestion is detected, it <u>lowers</u> the priority level of the test packets and then either <u>lowers</u> the priority level of the <u>data packets</u> to the same lower level or <u>disconnects</u> the flow. Here is the exact language from paragraphs 19-20 of Tezuka:

> the calling VoIP gateway transmits a test packet which has a predetermined priority set for the audio packet flows and is transferred on the audio packet flows to the called VoIP gateway, the relay router monitors a packet flow which passes through the relay router and which is transferred with the predetermined priority, receives the test packet in the first and second directions until the test packet is turned back to the calling VoIP gateway by way of the called VoIP gateway, uses the received test packet to determine whether congestion is caused by setting the audio packet flows in the first and second direction or not, and changes the predetermined priority set for the test packet into a priority lower than the predetermined priority when the congestion is caused, when the priority set for the test packet turned back to the calling VoIP gateway is changed, the calling VoIP gateway changes the priority of the audio packet flow in the first direction into a priority lower than the predetermined priority or disconnects the audio packet flow in the first direction, and the called VoIP gateway changes the priority of the audio packet flow in the second direction into a priority that is set for the audio packet flow in the first direction when the priority of the audio packet flow in the first direction is changed into a priority lower than the predetermined priority, or disconnects the audio packet flow in the second direction when the audio packet flow in the first direction is disconnected.
>
> **[0020]** A third aspect of the present invention is a VoIP gateway functions as a calling VoIP gateway. The VoIP gateway device includes: a setting unit for setting a new audio packet flow extending from a calling side to a called side and having a predetermined priority between a calling VoIP gateway and a called VoIP gateway to establish a telephonic communication call through a VoIP network; a inquiring unit for inquiring of a subscriber of the telephonic communication call about control contents of the new audio packet flow when congestion caused by setting the new audio packet flow is detected by a relay router for relaying an audio packet transferred on the new audio packet flow; and a control unit for changing the priority set for the new audio packet flow into a priority lower than the predetermined priority or disconnecting the new audio packet flow according to a reply from the subscriber.

Therefore, as can be seen from Tezuka, there is no disclosure or suggestion of transmitting a plurality of test packets at a lower priority level than data packets that are then transmitted between endpoints on the network at the higher priority level, as claimed. Furthermore, Tezuka requires specialized hardware (modified routers) where the claimed invention can be implemented "without specialized hardware" in the network (present specification at paragraph 13). In summary, the avoidance of impacting existing network traffic by using test packets having a lower priority level than data packets is an unexpected result rendering the claimed invention non-obvious.

As to dependent claim 5, which recites that the test packets are transmitted at a data rate corresponding to an expected connection bandwidth, the office action cites page 258 of Du as disclosing this feature. Applicant has carefully studied this portion of Du but could find no such disclosure or suggestion. Instead, this appears merely to discuss "probe packets" without any discussion of the data rate at which they are transmitted. Consequently, it does not appear that this feature is disclosed or suggested by the prior art.

As to dependent claim 13, which recites that the network is a packet-switched network comprising packet switches that maintain queues, as pointed out above, Du merely discloses an ATM network and, given that independent claim 1 (from which claim 13 depends) has been limited to IP or Ethernet networks, no such feature is found in Du. See also office action at page 13 (stating that Du does not disclose the use of IP networks for test packets).

Claims 2, 10, and 14 stand rejected based on the combination of Du, Vukovic, and Tezuka (U.S. Pub. 2003/0107991).

The rejection of claim 2 has become moot in view of the cancellation of that claim.

Dependent claim 10 was rejected based on the combination of Du, Vukovic and Tezuka. As explained above, the combination of these references is not proper. Even were the combination proper, however, the feature of dependent claim 10 ("wherein the test packets are transmitted at a priority level that is lower than the data packets in step (3), but higher than other data packets containing other data transmitted on the network") would not be found in the combination. The office action suggests that this feature is shown in FIG. 10 and in paragraphs 159, 160, 162, and 167 of Tezuka. Applicant has carefully studied these portions of Tezuka but cannot find any disclosure or suggestion for the claimed three-level priority scheme of (1) data packets; (2) test packets; and (3) other data packets as claimed. Paragraphs 159, 160, and 162 explain that the test packets of Tezuka are actually transmitted at a <u>higher</u> priority level than the data packets. If congestion is

detected, the priority level of the test packets is lowered. There is no third priority level for "other data packets" as claimed. FIG. 19 does not mention priority levels of any type.

Claims 3-9 and 11 stand rejected on the basis of Du, Vukovic, and Komatsu (U.S. 6,914,900).

As to dependent claim 4, which recites the step of evaluating dropped packet rates associated with the test packets in the different time slots, Komatsu does not disclose evaluating dropped packet rates associated with the test packets as claimed, but instead mentions evaluating packet loss of data packets during the call. See FIG. 8J ("measure packet loss rate prevailing during call"); column 12 lines 30-36 (same). Consequently, the features of dependent claim 4 are also not disclosed or suggested by Komatsu. At best, Komatsu discloses (col. 2 lines 56-58, not cited by the office action) sending "a [single] test packet," not the plurality of test packets as claimed.

Dependent claim 6, which (as amended) recites the step of a network endpoint performing an evaluation of packet statistics associated with the test packets transmitted over plurality of different time slots, was rejected on the same basis as dependent claim 4. For similar reasons as above, there is no such suggestion or disclosure in Komatsu.

Dependent claim 7, which (as amended) recites the step of a network endpoint performing an evaluation of latencies and dropped packet rates associated with the plurality of time slots, was rejected based on Komatsu's disclosure of FIG. 3 (element 304) and column 7 lines 30-40. As explained above with reference to claim 4, Komatsu discloses only sending a single "test packet" and, furthermore, at most discloses measuring the latency of that single packet, not a "dropped packet rate" for a plurality of test packets as claimed.

Dependent claim 9, which recites that the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock, was rejected over the combination of Du, Vukovic, and Komatsu. According to the office action, Komatsu at column 3 lines 20-27 discloses routing IP packets over SONET frames that are synchronized to a clock. Applicant assumes that the reference to SONET in the office action was intended to refer to Komatsu's mention of STM (synchronous transfer mode). Applicants respectfully submit that the recited limitation is not shown or suggested in Komatsu and, in fact, Komatsu teaches away from the claimed feature. Column 3 lines 13-37 clearly explains that communication occurs over an IP network but if the communication quality is not good, the system switches over to "another route via a network (e.g., STM or ATM network) other than the IP network." See lines 23 and 34. Consequently, Komatsu

teaches that if the communication quality declines, the IP network should not be used and instead a different synchronous network should be used. This is in contrast to the claimed feature of sending IP packets that are scheduled for transmission within time slots within a frame that is synchronized to a clock. Accordingly, this feature is not shown or suggested in the prior art.

Independent claim 15 and dependent claim 16 stand rejected over the combination of Du, Vukovic, and Komatsu. As set forth above, this combination is not proper. Moreover, even if combined as proposed in the office action, the features of independent claim 15 would not be disclosed or suggested.

As amended, independent claim 15 recites the transmission of test packets and data packets over an "Internet Protocol (IP) network or Ethernet network comprising a plurality of packet switches." Step (1) recites establishing a time reference frame for transmitting packets between two network endpoints over such a network. As explained above, Du does not disclose an IP or Ethernet network but is instead directed to ATM (asynchronous transfer mode) networks, a point acknowledged in the office action at page 13. Moreover, claim 15 recites a step of "synchronously transmitting a plurality of data packets" over the network during time slots empirically determined to be associated with a reduced level of packet contention. The office action states that it would have been obvious to incorporate an IP network into Du because Komatsu states that an IP network offers the best traffic service and costs less than legacy telecom systems, and because IP networks suffer from low quality of service from congestion and would benefit from a QoS upgrade as stated by Komatsu in column 1 lines 57-67 (office action at page 13). But Komatsu specifically teaches that in response to congestion on the network, the IP network should not be used and instead packets should be routed over an STM or ATM network. See Komatsu at column 3 lines 13-37. Consequently, Komatsu teaches away from the claimed combination. The combination, even if proper, would not disclose synchronously transmitting data packets over an IP or Ethernet network based on empirically determined time slots as claimed.

Dependent claims 17-18 stand rejected over the combination of Du, Vukovic, Komatsu, and Tezuka. As to dependent claim 17, which more specifically recites transmitting a plurality of test packets "using a packet priority level lower than a packet priority level used to transmit the plurality of data packets in step (3)," as pointed out above, the combination of these references is not proper. Moreover, as explained above, none of these discloses transmitting a plurality of test packets at a priority level lower than that used to transmit data packets. Accordingly, dependent claim 17 is

distinguishable for this additional reason.

Dependent claim 18, which recites "transmitting the test packets at a data rate sufficient to support a desired bandwidth in step (3)," was also rejected over the combination of Du, Vukovic, Komatsu, and Tezuka. In addition to the improper combination, nothing in these references discloses any data rate at which a plurality of test packets is transmitted. Accordingly, even if proper, the claimed features would not be disclosed.

Independent claim 19 and dependent claim 20 stand rejected based on the combination of Du, Vukovic, and Tezuka. Independent claim 19 (as amended) recites an apparatus programmed to carry out certain steps which are similar to those discussed above with respect to independent claim 1. Although not limited to an IP or Ethernet network, independent claim 19 recites transmitting a plurality of test packets at a first priority level over a plurality of time slots and, after evaluating which of the plurality of time slots corresponds to favorable traffic conditions, transmitting data packets at a second higher priority level over the favorable time slots. The arguments above (except for the IP and Ethernet network limitation, which does not appear in independent claim 19) are generally applicable to independent claim 19. Accordingly, independent claim 19 is not rendered obvious based on the combination of Du, Vukovic and Tezuka.

Dependent claim 20, which recites evaluating packet latencies associated with the test packets previously recited in the claim, was rejected on the same basis (Du, Vukovic and Tezuka). In particular, page 16 of the office action states that Du shows evaluating packet latencies with a second computer connected to the network. (Note that the "packet latencies" recited in the claim refers to step (2) of the claim, in which the evaluation is done "on the basis of step (1)" where test packets are transmitted.). In other words, it is the packet latencies of the test packets that are evaluated. Dependent claim 20 has been further amended to make this distinction more clear.

The office action appears to be inconsistent regarding whether Du does or does not disclose evaluating packet latencies based on test packets. Page 16 of the office action states that Du discloses evaluating packet latencies, but page 7 of the office action states that Du does not teach evaluating packet latencies associated with test packets. If a further office action is issued, Applicant requests that this point be clarified.

Applicant has submitted new claims that further relate to distinguishable features, many of them in addition to the patentability of the parent claims from which they depend:

New dependent claim 21 recites transmitting the test packets at a data rate that exceeds an

expected data rate for packets that are to be transmitted between two network endpoints (see specification at paragraph 29). This feature is not disclosed or suggested in the references.

New dependent claim 22 recites a zero contention level (e.g., FIG. 7) as the reduced level of packet contention, a feature which also does not appear to be disclosed or suggested.

New dependent claim 23 recites evaluating packet statistics associated with test packets, which as explained above is not shown or suggested.

New dependent claim 24 recites evaluating a dropped packet rate for the test packets, which as explained above is not shown or suggested.

New dependent claim 25 recites evaluating packet latencies of the test packets, which as explained above is not shown or suggested.

New dependent claim 26 recites that the test packets and data packets are IP packets transmitted over a packet-switched network, which as explained above is not shown or suggested.

New dependent claim 27 recites that the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock (FIG. 6), which as explained above is not shown or suggested.

New dependent claim 28 recites that the test packets are transmitted at a priority level that is lower than the data packets but higher than other data packets containing other data (FIG. 3), which as explained above is not shown or suggested.

New dependent claim 29 recites that the data packets comprise voice data (paragraph 21).

New dependent claim 30 recites that the network is a packet-switched network comprising packet switches that maintain packet queues (FIG. 7).

New independent claim 31 recites a system comprising at least 3 network endpoints that contend for resources in a shared packet switched network (FIG. 2), each processor programmed with computer instructions that transmit test packets having a priority level lower than that assigned to data packets and that emulate data packets that are to be transmitted between two network endpoints (FIG. 3, FIG. 5), evaluating which time slots correspond to favorable network traffic conditions, and synchronously transmitting data packets over the network (FIG. 4, FIG. 5, paragraph 23, paragraph 26).

New dependent claim 32 recites evaluating packet statistics corresponding to the test packets.

New dependent claim 33 (dependent from claim 1) recites that the data packets comprise

video data (paragraph 21).

New dependent claim 34 (dependent from claim 1) recites that the data packets comprise TDM data converted into IP packets (paragraph 21).

New dependent claim 35 (dependent from claim 19) recites that the data packets comprise video data (paragraph 21).

New dependent claim 36 (dependent from claim 19) recites that the data packets comprise TDM data converted into IP packets (paragraph 21).

New independent method claim 37 recites a method of transmitting Internet Protocol (IP) network comprising a plurality of network switches, including (1) establishing a time reference frame comprising a plurality of time slots corresponding to candidate times during which packets may be transmitted between network endpoints on the network; (2) transmitting over a plurality of the time slots a plurality of test packets from a first endpoint on the IP network to a second endpoint on the IP network, wherein the plurality of test packets are transmitted at a first priority level and are transmitted at a data rate corresponding to an expected rate to be experienced during a subsequent communication between the first and second endpoints on the IP network, (3) evaluating, at one of the first and second endpoints, packet statistics for the test packets, wherein the packet statistics are indicative of contention conditions in one or more of the plurality of network switches, (4) identifying one or more time slots corresponding to a low level of contention conditions; and (5) synchronously transmitting based on the time reference frame a plurality of data packets comprising one or more of voice data, video data, and TDM-over-IP data during the one or more of the time slots identified in step (4) to correspond to a low level of contention conditions in the one or more network switches, wherein the data packets are transmitted at a priority level higher than the first priority level of the test packets. As explained above, many of the features of this claim are not shown or suggested, such as (a) establishing a time reference frame over an IP network; (b) transmitting test packets over the IP network at a priority level lower than data packets and at an expected data rate for the data packets; (c) evaluating packet statistics at one of the endpoints indicating contention conditions in network switches; and (d) synchronously transmitting based on the time reference frame over the IP network.

Conclusion

Based on the foregoing, Applicant respectfully submits that the application is in condition for allowance. Should the Examiner believe that anything further is desirable in order to place the application in even better form for allowance, the Examiner is respectfully urged to contact Applicants' undersigned representative at the below-listed number.

Respectfully submitted,

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